

AT32 MCU-based development using RT-Thread Studio

Introduction

This application note describes how to use RT-Thread Studio IDE tool for AT32 MCU-based application development.

Applicable products:

MCU series	AT32F series
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1 Introduction

RT-Thread Studio is a free IDE development tool that offers a variety of component resources and easy-to-use graphical configuration, thus making application development easier and more efficient. The latest edition of RT-Thread Studio provides stronger support for AT32 MCU-based development. The subsequent sections describe how to drive AT32 MCU-based development through RT-Thread Studio tool in detail.

2 Environment requirements

2.1 RT-Thread Studio

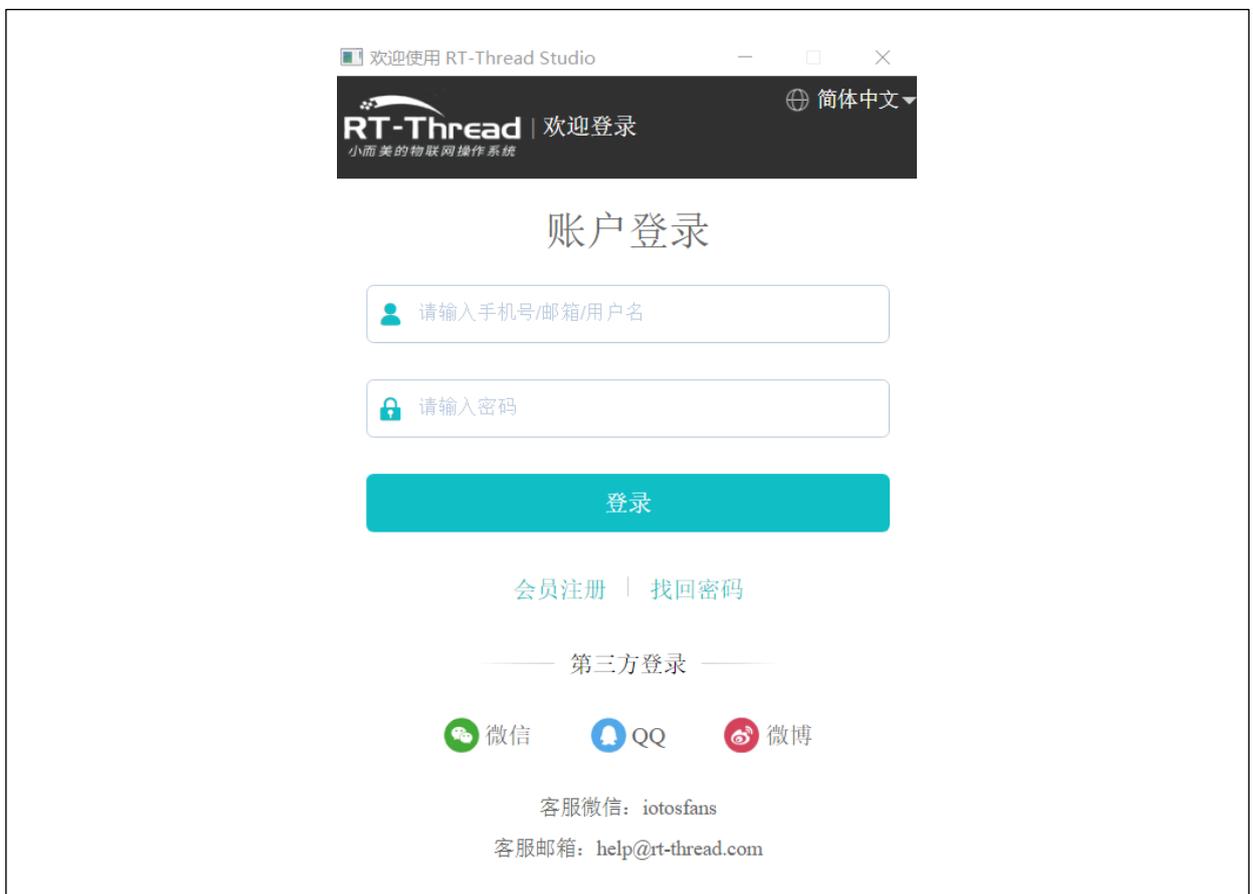
The latest version of RT-Thread Studio is available on the official website of RT-Thread company at <http://www.rt-thread.org/page/download.html#studio>.

After successful download, click on the *.exe to finish installation.

2.2 Login and register

After successful install, the Internet connection is needed for your first login. Then register an account and log in. After log in, the account is automatically remembered without requiring login for future operations. The third-party account is also supported for logging in (However, it is better to register an account).

Figure 1. Register and log in



2.3 Chip support package install

The first time you log in, you'll see a welcome page. Then you can enter the RT-Thread Studio development interface. As a core component of IDE, the development interface offers a wealth of configuration options, but they are very similar to other IDE tools in terms of content and functions, except for display mode. Therefore, the users just need focus on the special features of the RT-Thread Studio. The chip support package can be installed online and offline, which are detailed in the subsequent sections.

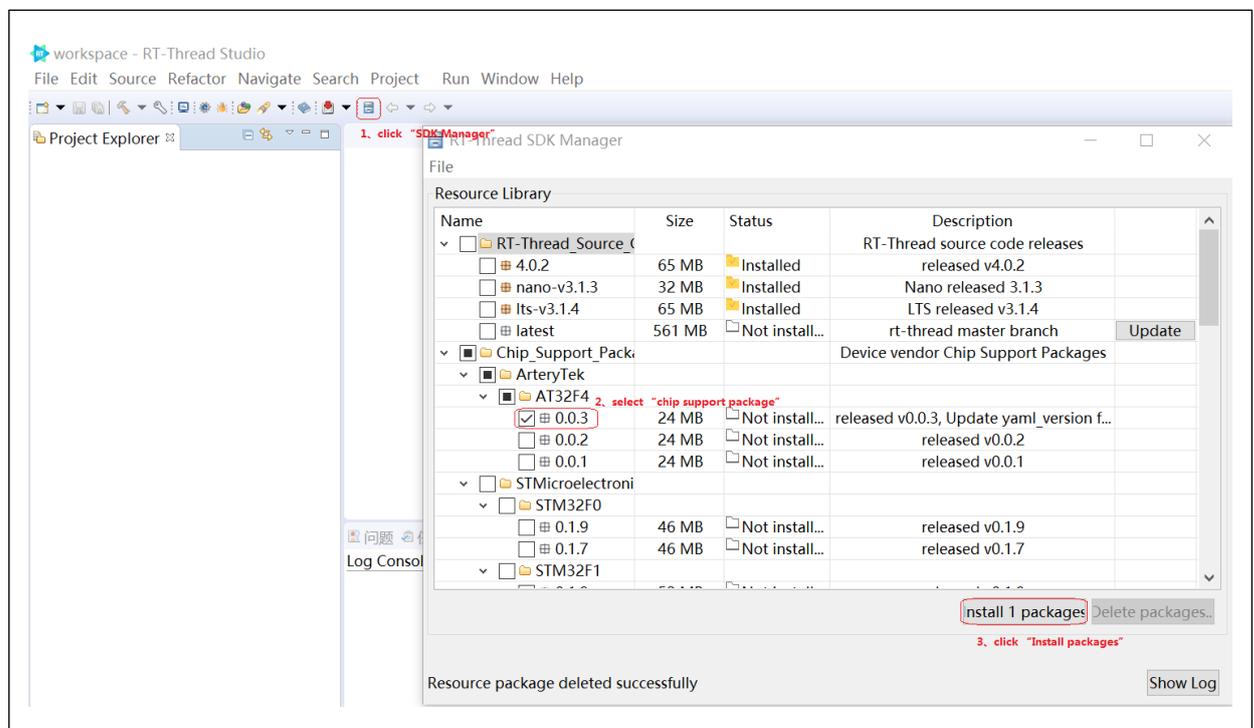
2.3.1 Online install

For online install, the chip support package is downloaded automatically through SDK tool.

Follow the steps below:

1. Click on "SDK Manager"
2. Select AT32 chip support package
3. Click on "Install Packages".

Figure 2. Online install chip support package



In Figure 2 above, the version of the chip support package is subject to the actual situation, that is, click on the latest version.

Note: The Internet connection is required for all download and installations.

2.3.2 Offline install

Prior to offline installation, it is necessary to get the chip support package prepared on your PC for use. Its file name is like this: sdk-csp-at32f4.zip.

Follow the steps below to install:

1. Click on “SDK Manager”
2. Click on “File”
3. Click on “Import resource pack”
4. Click on “Browse”, select an offline support package from PC
5. Click on “OK”

Figure 3. Offline install of chip support package

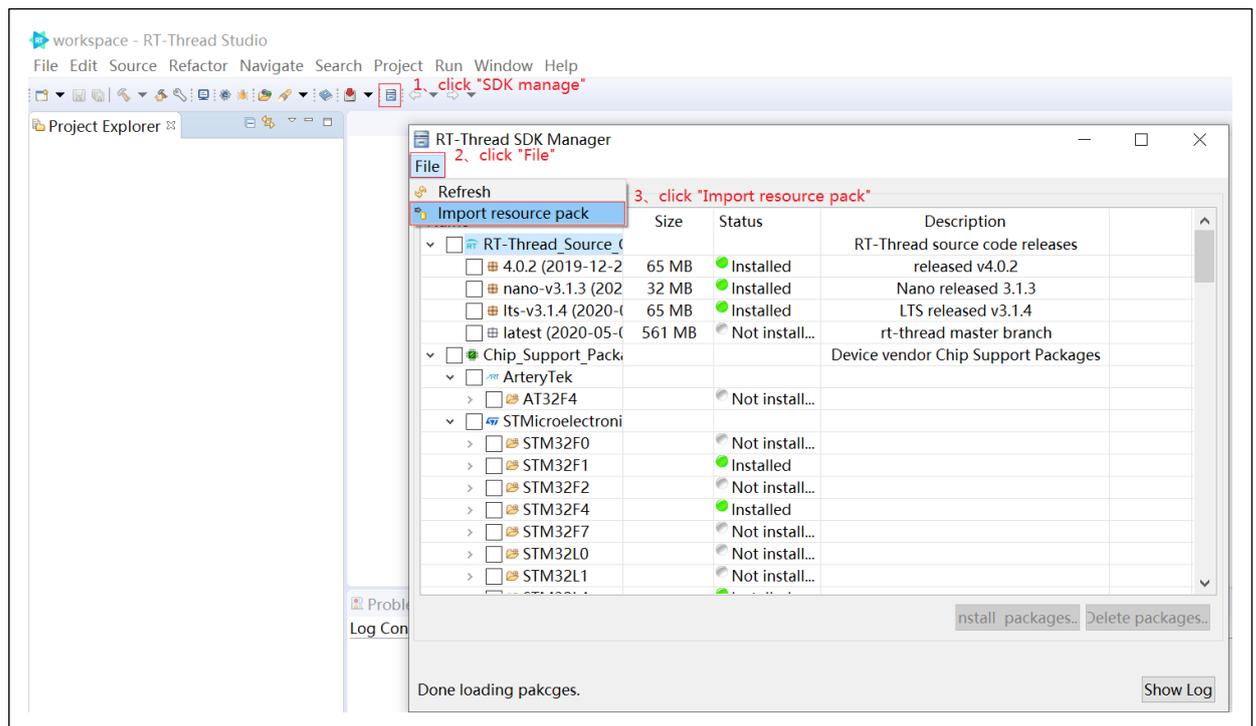
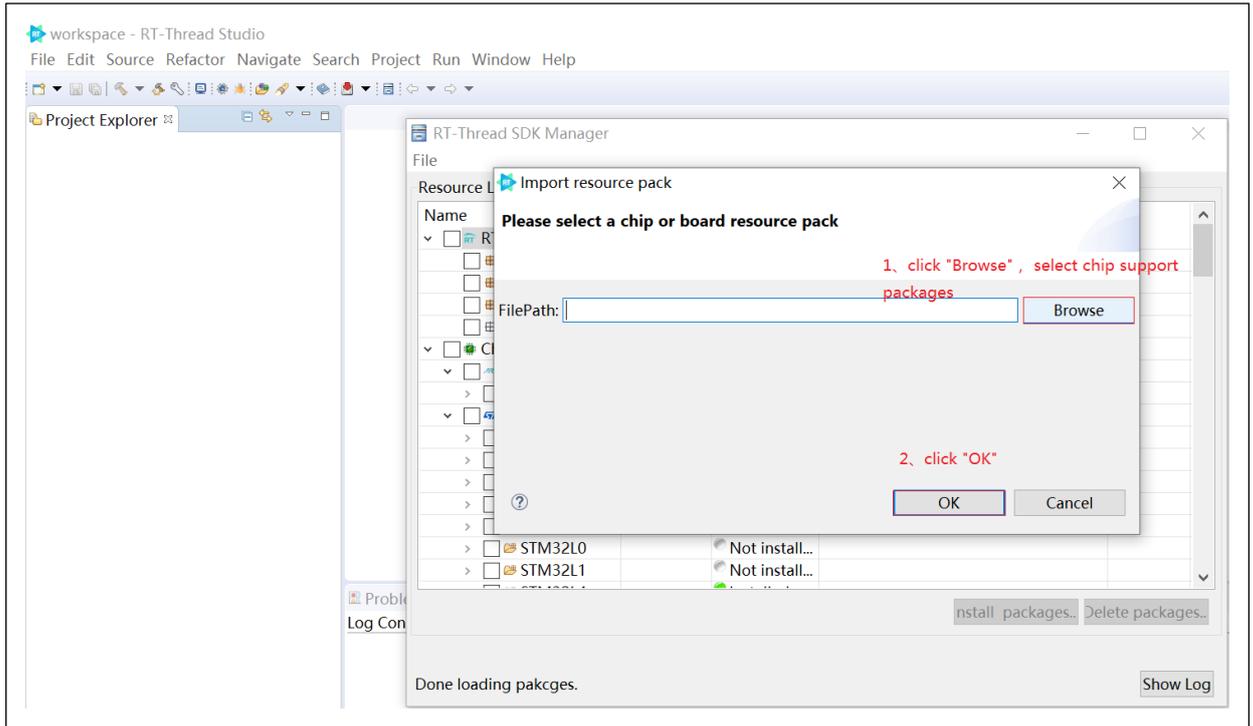
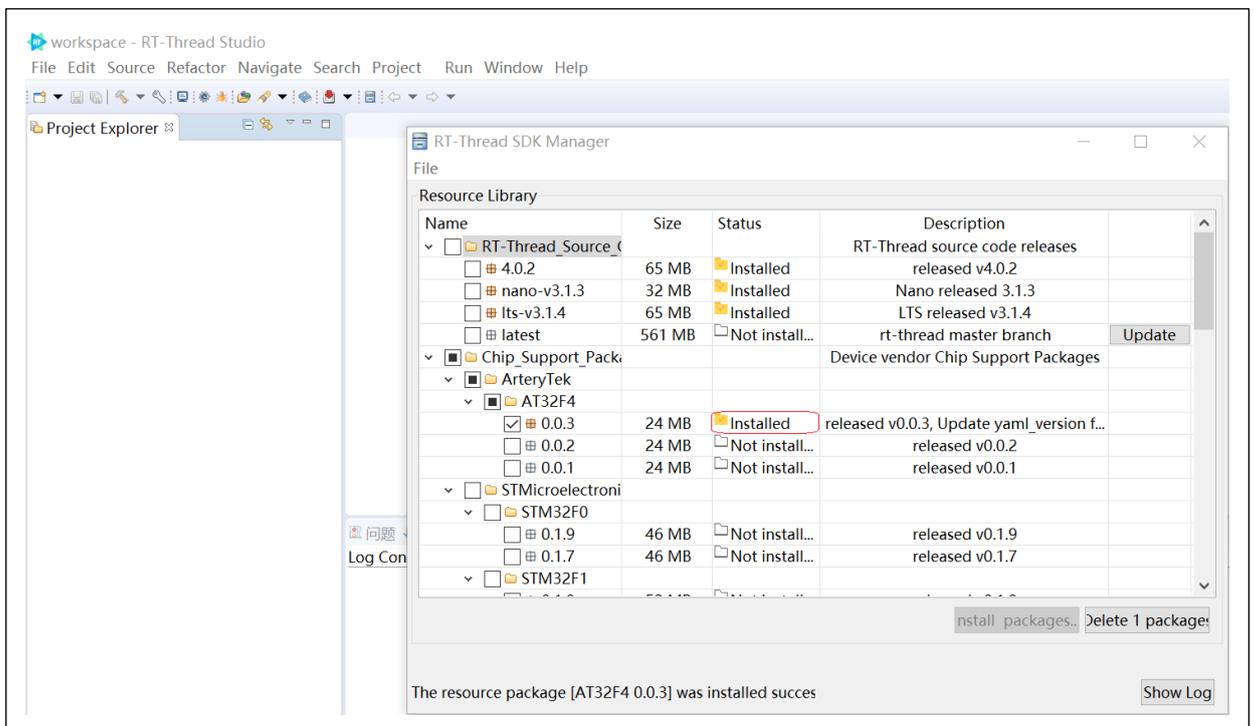


Figure 4. Select chip support package from PC



Whatever online or offline install, after successful installation, you will see that the status of chip support package is changed from “Not installed” to “Installed”, as shown in Figure 5.

Figure 5. AT32 chip support package install success



After successful install, users can select and configure the corresponding AT32 MCU for a newly created project. At the same time, the low-level driver files related to AT32 MCU are also ported into the new project. The driver files imported depend on the type of project (bare-board project, Nano project, RT-Thread Studio project)

3 Project development

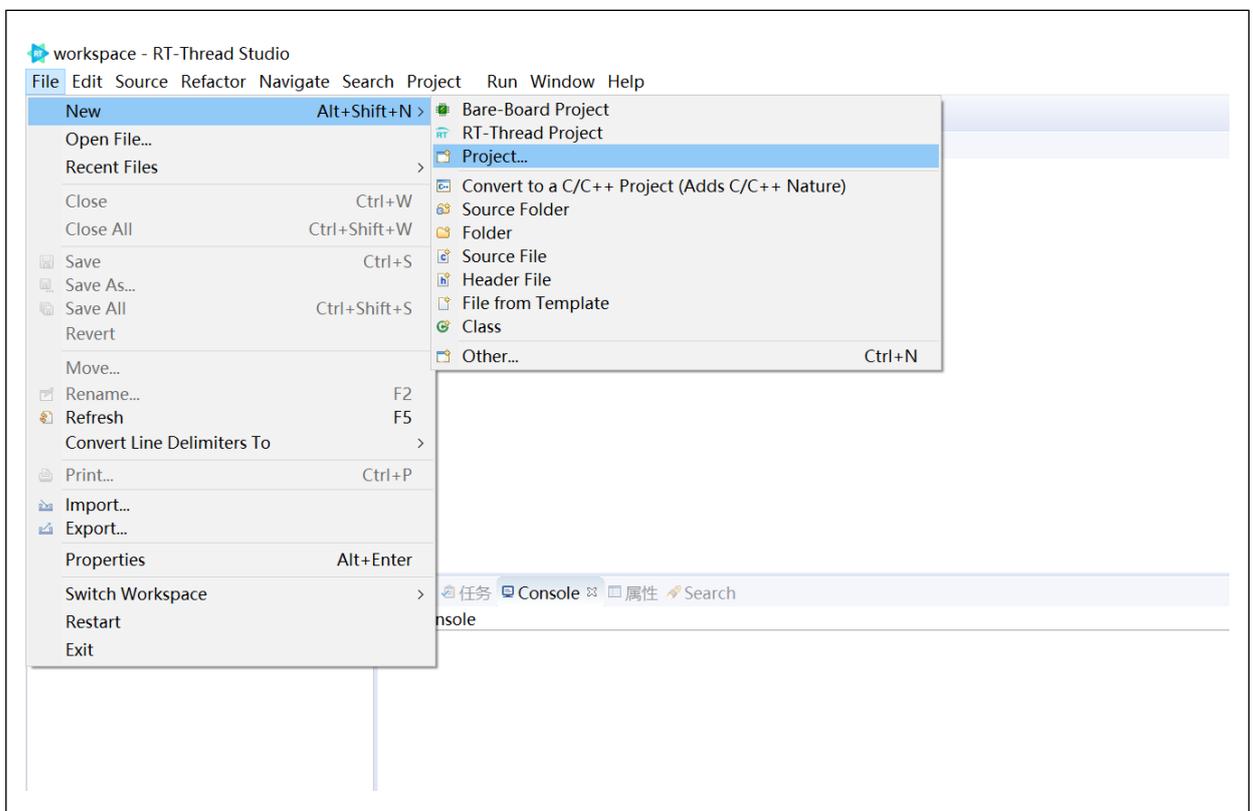
When it comes to AT32 MCU-based project development using RT-Thread Studio, the main focus is on project creation as the users need select a manufacturer, product series and part number pertaining to a microcontroller, as well as functional parameters such as console serial port, pins and adapter.

3.1 Project creation

Enter the RT-Thread Studio main interface, and follow the steps below to create a project:

1. Click on “File”
2. Click on “New”
3. Select “Project...”

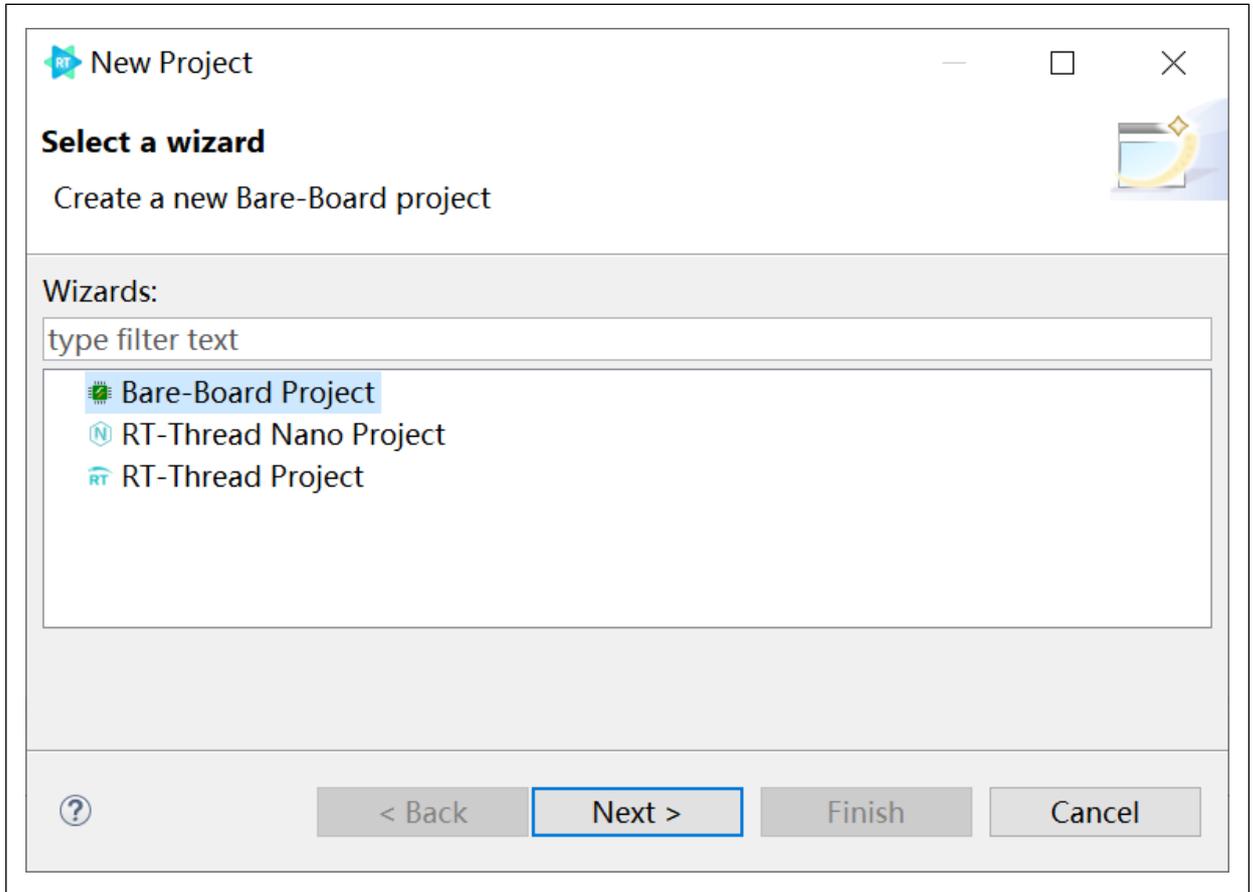
Figure 6. Create a project



After above operations, you will see three options available for your selection, as shown in Figure 7.

1. Bare-Board Project
2. RT-Thread Nano Project
3. RT-Thread Project

Figure 7. Project type selection



As the procedures of project creation are generally similar for these three projects, we take the “RT-Thread Project” as an example of demonstrating how to create a project.

After selecting “RT-Thread Project”, click on “Next>”, a dialogue window is displayed below:

Figure 8. Project parameters configuration

New Project

Create RT-Thread Project

Project name must be specified

Project name:

Use default location

Location:

Base On MCU Base On BSP

RT-Thread :

Vendor : Series :

Subseries : MCU :

Console UART : TXP : RXP :

Adapter : Port :

Suggestions after mcu based project created:
The chip use an internal HSI clock. If you need to modify it, please check and modify drv_clk.c

This window deals with parameters configuration, including project name, storage location, RT-Thread version and MCU-related information.

After a successful installation of AT32 chip support package, the users can select a desired MCU part number here.

In “Vendor” option, select “ArteryTek” on the drop-down menu.

In “Series” option, select “AT32F4” on the drop-down menu.

In “Subseries” option, currently, only AT32F403A and AT32F407 are supported, and more products will be added later (depending on the AT32 chip support package installed).

In “MCU” option, select a specific part number according to the needs

In “Console UART” option, select a console serial port and TX/RX pins

In “Adapter” option, select a debugger and J-Link/DAP-LINK

In “Port” option, select a debug interface (JTAG or SWD). The SWD port is recommended as it is a default interface of AT-LINK on our AT-START evaluation board.

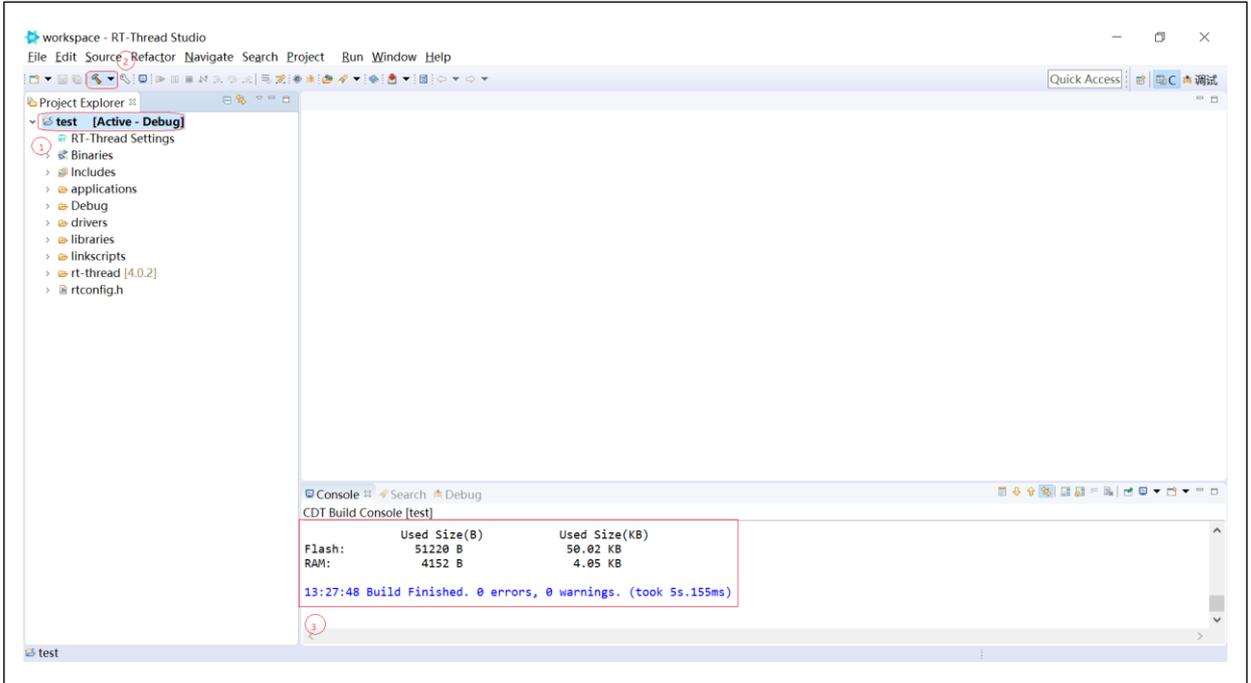
Finally, click on “Next>” or “Finish”, a project is generated.

3.2 Debug and download

After creating a project, follow the steps below to compile.

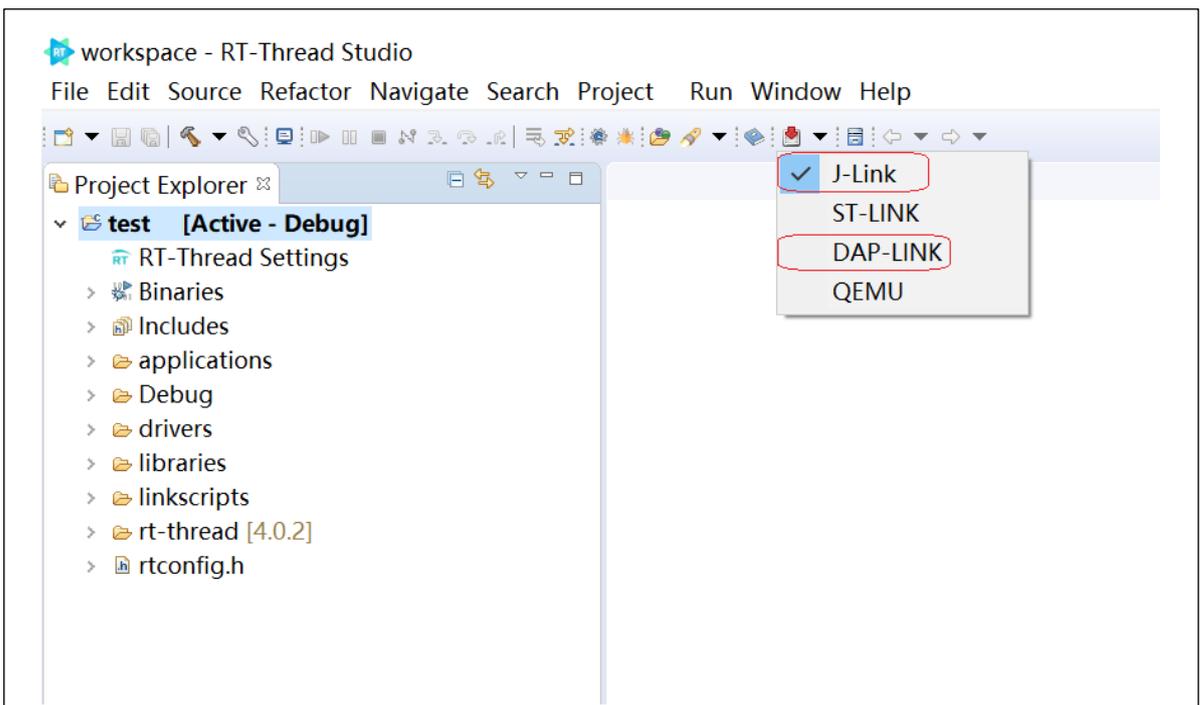
1. Click and select the new created project name.
2. Click on “Compile” icon
3. View output information

Figure 9. Compiling



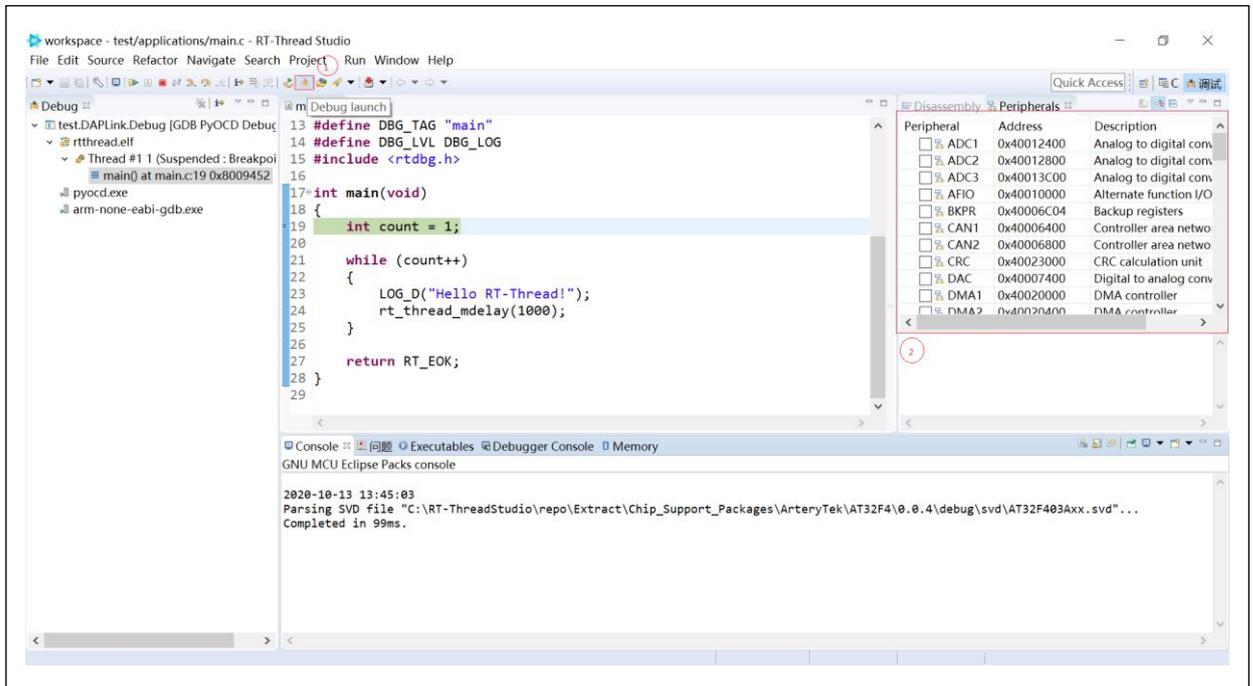
After successful compiling, it is ready to download and debug. In “Flash Download” icon, select an adapter (J-LINK or DAP-LINK). If you need to use AT-LINK on the AT-START evaluation board for downloading, please tick “DAP-LINK” here. Then click on “Flash Download” icon.

Figure 10. Download



To perform online Debug, click on “Debug Launch” icon to start downloading and debugging. Online debugging can be done in “step into” or “go” mode. The real-time register information is shown in the right side of the figure below.

Figure 11. Online debug

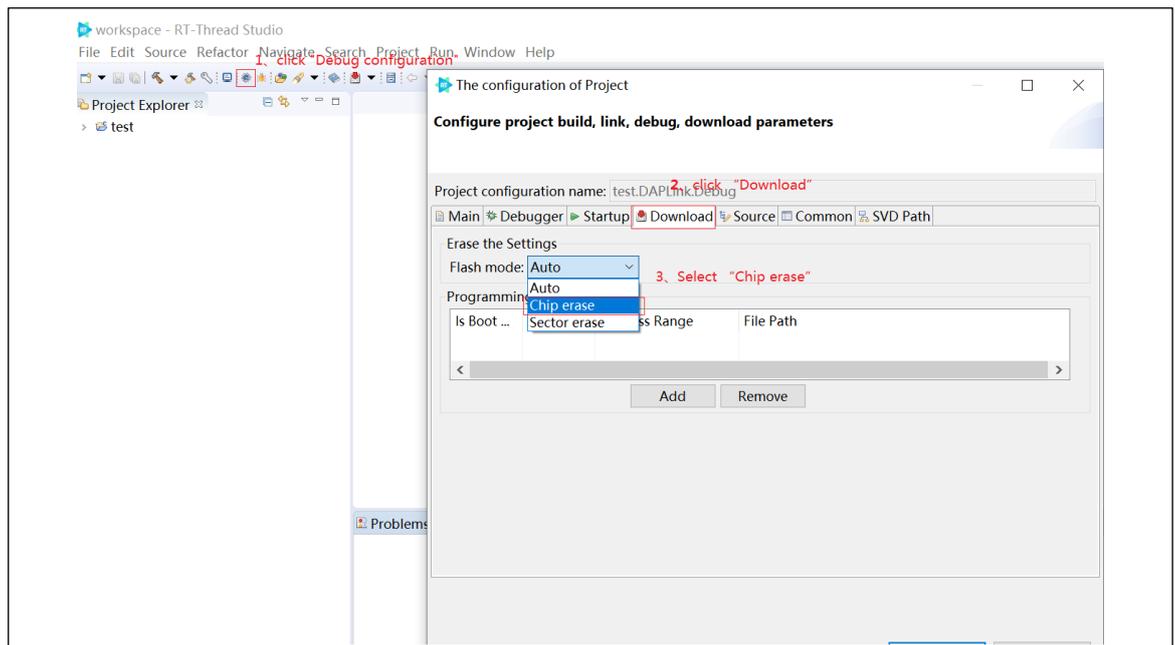


3.3 Precautions

There are several aspects worth of attention when using RT-Thread Studio.

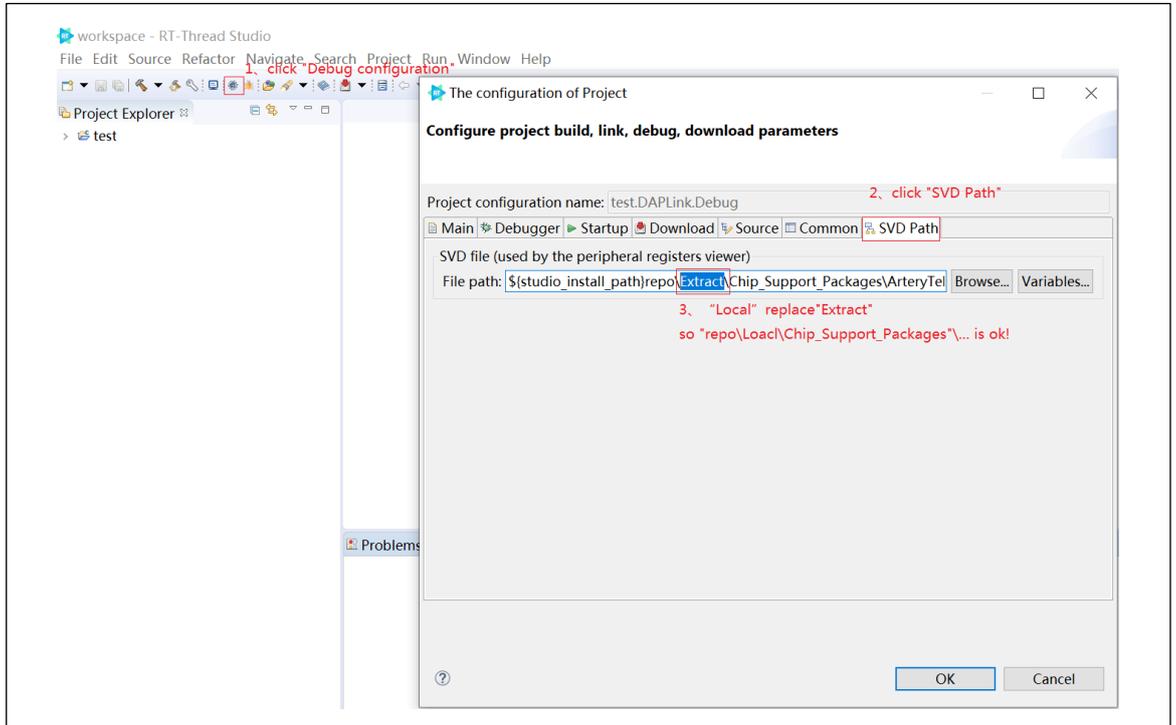
1. A chip support package must be installed before starting AT32 MCU-based development
2. Internet connection is required for development through tool kits.
3. When the “DAP-LINK” mode is used for downloading, it may cause errors due to mismatch issue. In this case, perform “Chip erase” operation.

Figure 12. Chip erase



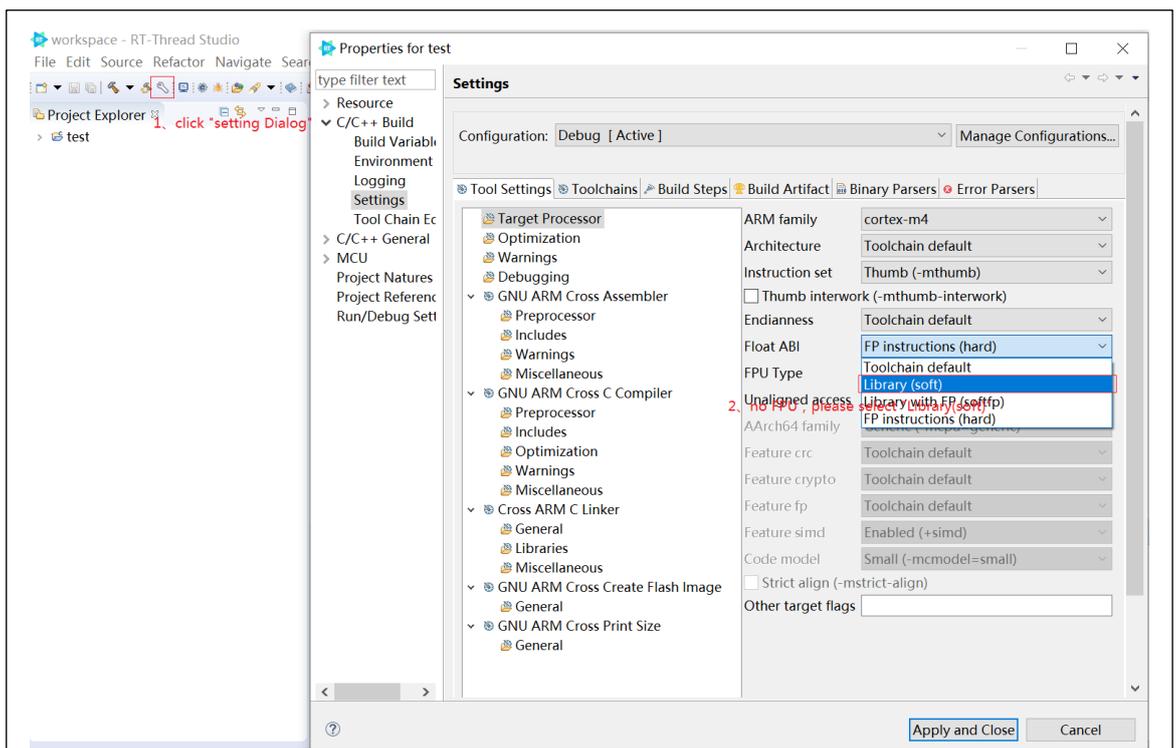
- For the chip support package installed offline, due to IDE itself, it may cause peripheral registers window to be unable to display during online debugging. In this case, replace “Extract” with “Local”, as shown below.

Figure 13. svd path configuration



- If the FPU is not supported by hardware of a certain MCU, for example, AT32F415, disable FPU option, and use soft floating mode to compile, so as to prevent C library or other errors, as shown below.

Figure 14. FPU settings



4 Revision history

Table 1. Document revision history

Date	Revision	Changes
2022.04.25	2.0.0	Initial release

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